

THE GENUS *PELARGONIUM* L'HER. EX AIT. IN AUSTRALIA.

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(Four Text-figures.)

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Synopsis.

Seven indigenous species of *Pelargonium* are distinguished and described, *P. helmsii* for the first time. *P. littorale* Hügel and *P. drummondii* Turcz. are reinstated. Introduced species are also considered. Some problems raised by the distributions of the various species are discussed.

INTRODUCTION.

The genus *Pelargonium* has attracted considerable attention due to the horticultural value of many of the species. It is not surprising, then, to find the most showy of the species occurring on the eastern seaboard of Australia being cultivated in Europe at quite an early date. *P. australe* was described by Willdenow in 1800 and it appears that it was widely cultivated even then. *P. inodorum* was described by the same worker a little later and, subsequently, the name was misapplied to a number of

TABLE 1.

Name.	Date.	Conspecific with.
<i>P. AUSTRALE</i> Willd.	1800	
var. <i>clandestinum</i> (L'Her. ex Hook f.) Hook. f.	1864	<i>P. inodorum</i> Willd.
var. <i>erodioides</i> (Hook.) Benth.	1863	<i>P. australe</i> Willd.
var. <i>major</i> Hook. f.	1855	<i>P. australe</i> Willd.
var. <i>glabrata</i> Hook. f.	1855	<i>P. australe</i> Willd.
<i>P. clandestinum</i> L'Her. ex DC.	1824	nom. nud.
<i>P. clandestinum</i> L'Her. ex Hook. f.	1853	<i>P. inodorum</i> Willd.
<i>P. crinitum</i> Nees in Lehm.	1844	<i>P. littorale</i> Hüg.
var. <i>congestum</i> Nees in Lehm.	1844	<i>P. littorale</i> Hüg.
<i>P. DRUMMONDII</i> Turcz.	1858	
<i>P. drummondii</i> sensu Hook. f., non Turcz.	1894	<i>P. capitatum</i> (L.) Ait.
<i>P. erodioides</i> Hook.	1834	<i>P. australe</i> Willd.
<i>P. glomeratum</i> (Andr.) Jacq.	1816	<i>P. australe</i> Willd.
<i>P. HAVLASAE</i> Domin.	1923	
<i>P. HELMSII</i> , sp. nov.		
<i>P. INODORUM</i> Willd.	1809	
<i>P. inodorum</i> sensu Sweet, non Willd.	1820-22	<i>P. australe</i> Willd.
<i>P. LITTORALE</i> Hüg.	1837	
<i>P. RODNEYANUM</i> Mitch. ex Lindl. in Mitch.	1839	
<i>P. stenanthum</i> Turcz.	1858	<i>P. littorale</i> Hüg.
<i>Erodium peristeroides</i> Turcz.	1863	<i>P. inodorum</i> Willd.
<i>Geranium australe</i> (Willd.) Poir.	1811	<i>P. australe</i> Willd.
<i>Geranium glomeratum</i> Andr.	1805	<i>P. australe</i> Willd.
<i>Geranospermum australe</i> (Willd.) O. Ktze.	1891	<i>P. australe</i> Willd.
<i>Geranospermum rodneyanum</i> (Lindl.) O. Ktze.	1891	<i>P. rodneyanum</i> Mitch. ex Lindl. in Mitch.

Australian species. Others have since been described, but Bentham (1863) admitted only two, reducing the others to synonymy of *P. australe* and one, *P. erodioides* Hook., to varietal rank. Knuth (1912) reinstated *P. inodorum*, equating it with *P. erodioides*. This action only served to increase the confusion surrounding the names, primarily caused by Sweet (1820-2) when he described inland forms of *P. australe* as *P. inodorum* (see below). Table 1 sets out the author's opinion with regard to the application of the various names that have been used for the indigenous taxa.

The characters used to distinguish between the sections of this genus are often connected with the habit of the plants. Collectors do not always obtain complete specimens in this respect and it must be urged that in future specimens should show the basal parts of the plant, even the roots, as these are often particularly important.

The habit conditions are summed in Figure 1 in which both indigenous and introduced species are represented. The species normally classified in sect. *Peristera* (Groups I and II below) form a very short, basal, more or less horizontal, perennial stem from which, each year, arise leafy, deciduous, flowering branches. These are apparently terminal and the growth of the basal, perennial stem is sympodial just as that of the deciduous branches. The perennial stems may be quite elongated when the plant is gradually becoming smothered in drifting sand and they are frequently branched. The root system of this group consists of a swollen, but not tuberous, tap-root which may be branched. *P. rodneyanum* belonging to sect. *Polyactium* shows a

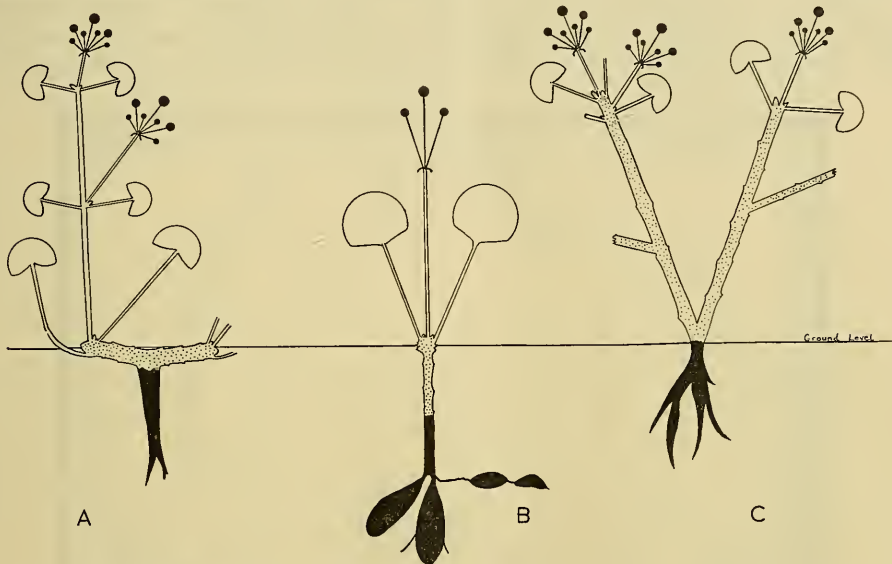


Fig. 1.—Habits of *Pelargonium* species. A. Groups I and II (in *P. drummondii* the perennial stems are more erect). B. Group IV. C. *P. capitatum*, *P. × asperum*, *P. domesticum*, etc. Roots and flowers, solid black; perennial stems, stippled; deciduous parts, white.

slightly different habit. The root system consists of a number of, or rarely one, root tubers attached to the main, slender root by very narrow roots. The basal perennial portion of the stem is sometimes elongated and narrow right at the base, but this seems to be a function of the habitat which is generally in rock crevices. The flowers in this group are borne on few-leaved deciduous stems. *P. havlasae* probably has much the same habit, although root tubers have not been observed on any of the specimens examined. The typical growth form of sect. *Pelargonium* is shown by the introduced species *P. capitatum* and *P. × asperum*, and others which are of less frequent occurrence. They do not show such an obvious differentiation of stem into perennial-basal and deciduous. The habit is definitely shrubby with the more or less leafless peduncles as the only consistently deciduous shoots. *P. drummondii* has a habit similar to that of the sect. *Peristera*, but the basal stems are larger and semi-succulent. Its sectional position is doubtful (see below).

Eichler (Blüthendiagramme) emphasizes the tendency towards cincinnal growth. This is not only found in the vegetative development, but also in the inflorescence. This is a cymose umbel, commencing as a dichasium and eventually passing out into cincinnati.

Odour is often a distinguishing character of *Pelargonium* species. Of the native species *P. inodorum* [*sic*] and *P. helmsii*, when making good growth, always have a characteristic odour. The single living collection of *P. littorale* which has been examined also had the same characteristic odour. The other indigenous species have an extremely weak odour which cannot be detected except when the plant is kept in an enclosed space for some time. The odour is not like that found in the other group.

Other characters that have provided the bases of this treatment are: (i) the number of fertile stamens, which for each species is variable within limits; (ii) the indumentum type; (iii) relative length of petals and sepals; (iv) colour of petals; (v) shape of sepals; (vi) length of calyx spur, which varies within quite wide limits in each species.

TAXONOMY.

PELARGONIUM L'Her. ex Ait. (applying to species found in Australia only).

Annual or perennial herbs or low shrubs. *Leaves* simple or almost compound, dentate, lobed to deeply dissected, hairy with long simple hairs and short glandular ones or almost glabrous, often aromatic; margin sometimes undulate. *Flowers*



Fig. 2.—Map showing distribution of *Pelargonium* spp. *P. littorale*, ×; *P. helmsii*, ▲; *P. inodorum*, ●.

irregular, arranged in dichasia passing into monochasia in the ultimate branches and condensed into simple umbels; inflorescences terminal, themselves arranged in cincinni. *Sepals* 5, usually quincuncial, connate basally; posterior one with a spur or pocket adnate to the pedicel. *Petals* 5, usually convolute, free, often clawed, white to deep pink or purple; posterior ones usually larger and often marked with darker veins or spots. *Stamens* 10, 3–8 bearing anthers; filaments more or less lanceolate to elliptic, often irregularly united basally. *Ovary* 5-locular with two ascending ovules in each loculus inserted on the axis near the base, hirsute. *Fruit*, a schizocarp splitting into five mericarps each containing a single seed, open on the ventral suture and without a pronounced tuft of hairs on the "aril"; outer part of style persistent as a coiled awn terminal on the mericarp and with long hairs on the inner surface, glabrous

outside. *Rostrum* hirsute. *Seed* not distinctly reticulate, sometimes punctate and usually eventually released from the pericarp.

The groups indicated below are considered to have some taxonomic status, but until a complete revision of the genus is available that status must remain uncertain.

INDIGENOUS SPECIES.

GROUP I. Fertile stamens 3–5. Simple hairs patent, usually rigid. Nectary tube usually short. Petals usually scarcely longer than the calyx. Plants with characteristic odour. Sect. *PERISTERA* pro parte.

PELARGONIUM INODORUM Willd., *Enum. Plant. Hort. Reg. Bot. Berol.*, 702 (1809) et *Hort. Berol.*, t. 34 (1816).

Synonymy: *P. clandestinum* L'Her. ex DC., *Prodr.* 1: 660 (1824) nom. nud. *P. clandestinum* L'Her. ex Hook. f., *Flora N.Z.*, 41 (1853). *P. australe* Willd. var. *clandestinum* (L'Her. ex Hook. f.) Hook. f., *Handbook N.Z. Flora*, 37 (1864). *Erodium peristeroides* Turcz. in *Bull. Soc. Imp. Nat. Moscou*, 36: 592 (1863).



Fig. 3.—Map showing distribution of *Pelargonium* spp. *P. drummondii*, ●; *P. rodneyanum*, ▲; *P. havlasae*, ■; *P. capitatum* ×.

Weak, erect, annual or short-lived perennial, more or less odoriferous herbs with fleshy, tapering tap-roots. *Flowering* stems terete, 5–35 cm. tall, usually branched; simple hairs scattered over the surface, usually short but rarely long, patent and with shorter glandular hairs. *Leaves* opposite: laminae ovato-cordate, 0.8–4.0 cm. long, 0.8–5.0 cm. wide, often 5–7-lobed, crenate, scattered hairs present on both surfaces or upper surface quite glabrous; petioles slender, 1.0–4.0 (5.0) cm. long, slightly hairy; stipules brown, scarioso-membranous, deltoid, 2–4 mm. long, 1–3 mm. wide, sometimes drawn out into a short awn, ciliate; bracts brown, scarioso-membranous, narrow-lanceolate, c. 3 mm. long and 0.5–1 mm. wide, often shortly aristate, ciliate. *Peduncles* 3–8 cm. long. *Flowers* arranged in umbels of 3–14 flowers, sub-sessile or on slender pedicels up to 3 mm. long in flowering stage, lengthening to 2–10 mm. in fruiting stage. *Sepals* 5, united basally into a tube 1 mm. long or less; lobes broad-lanceolate or ovate, 2–4 mm. long (including a short mucro), 1.5–2.0 mm. wide, covered with usually short coarse

simple hairs with some very short glandular ones, membranous towards the margin; about as long as the mericarps and therefore not incurved around them in the fruiting stage; nectary tube 0.5–1 mm. long. *Petals* usually deep pink, ligulate; posterior ones 2–4 mm. long and 1 mm. wide, sometimes with darker veins; anterior ones smaller; all scarcely exceeding sepal lobes although sometimes half as long again. *Stamens* 10; filaments broadened below and irregularly united, 3–5 bearing anthers; others sterile, three of which are usually longer than the remaining ones. *Fruit*: mericarp pilose, obovoid, 2 mm. long, 1 mm. wide, terminated by a long awn; rostrum, 8–12 mm. long, upper glabrous region plus stigmatic lobes 1.0–1.5 mm. long. *Seeds* black or grey, striate, 1.5 mm. long, 1 mm. wide or less.

Range: Great Dividing Range and associated ranges extending onto the Western Slopes in Eastern Australia, Tasmania and New Zealand.

Habitat: Woodlands, mostly on acid rocks, but has been found on basaltic soils.



Fig. 4.—Map showing distribution of *Pelargonium* spp. *P. australe*.

Typification: Holotype: Willdenow no. 124, 35 (B). There is some confusion with regard to this name. Willdenow himself was partially responsible when he stated "Habitat ad Cap. b. Spei?" Sweet stated that this was an error, but his description and figure do not agree with Willdenow's, thus: Sweet: "Branches thickly clothed with soft villous hairs. . . . Leaves . . . thickly clothed on both sides with short villous hairs. . . ."; Willdenow: "Caules . . . glabriusculi. . . . Folia utrinque glabra."

Sweet's description and plate apply to an inland form of *P. australe*. He misapplied Willdenow's name. Many later authors perpetuated this mistake. Thus Bentham sank *P. inodorum* in *P. australe*, but the description that he gives for *P. australe* var. *erodioides* is more in keeping with Willdenow's diagnosis of *P. inodorum* than it is with the type of *P. erodioides* Hook. Knuth further confused the situation when he placed *P. erodioides* as a synonym of *P. inodorum*.

Photographs of the Holotype show that the Australian material included is almost certainly conspecific with it. Willdenow's diagnosis does not agree, strictly, in two respects: i.e., "corolla . . . calyce duplo majore" (it is uncommon to have such large

petals in this species) and "Filamenta decem, quorum duo brevissima sterilia septem vero apice filiformis antherifera" (none of the specimens known to this author have more than five fertile stamens, the usual condition is two very short and sterile, three or four long and sterile and four or five long and fertile: it is possible that Willdenow took some of the long sterile filaments to be fertile).

P. clandestinum *Holotype*: Banks, Nova Zealandia (L'Héritier n. 29) (GEN). This name was published by De Candolle, without description, as a synonym of *P. acugnaticum* Pet. Th. It was subsequently taken up by J. D. Hooker, citing "L'Héritier Geran. ined., A. Cunn. Prodr." (presumably a misprint for DC. Prodr.).

Erodium peristeroides Turcz. A series of *Syntypes*: Nova Zealandia Everard Home (KIEW photos SYD). Since writing the paper on *Erodium* (Carolin, 1958) material of these specimens has been forwarded from Kiew. There is little doubt that they belong to this species.

Discussion: Although *P. clandestinum* L'Her. ex DC was published as a synonym of *P. acugnaticum* Pet. Th., there appears to be no very close relationship between these two species. The indumentum and the calyx spur differ markedly (two specimens in N.S.W. and photographs of the type material in B.M. of *P. acugnaticum* were examined). Nor does there appear to be any substantial agreement between *P. inodorum* and *P. grossularioides* (L.) Ait., a South African species to which it has been compared several times. It would seem that no extra-Australian specimens should be referred to this species except those occurring in New Zealand. The specimens retained in the Dominion Museum, Wellington, N.Z., have all been examined and it seems that they are conspecific with the Australian material.

There is some variability within the species, particularly in Tasmania where forms with congested umbels occur. As intergrades with the typical form occur frequently it seems inadvisable to admit these variations to a definite category.

Selection of Specimens Examined: QUEENSLAND: Mt. Barney, Macpherson Range, E. Constable, 15.11.1952 (NSW24348); Mt. Ngun Ngun, Prof. R. Good, 6 Dec. 1956 (BRI 007603); Cunningham's Gap, F. M. Bailey (NSW42475). NEW SOUTH WALES: Morangarell, 30 m. from Temora, J. L. Boorman, 11.17 (NSW42504); Lookout Point, Gibraltar Range, E. F. Constable, 26 Apr. 1956 (NSW42508); Port Stephens, J. L. Boorman, 9.19.11 (NSW42529); Narrabeen, H. Salassoo, no. 1025, 4.1.1953 (NSW2645); Jenolan Caves, W. F. Blakely, 11.99 (NSW42510); Concord, O. D. Evans, Nov. 1926 (SYD); Wentworthville, R. G. Tupper, 1933 (SYD); National Park, L. R. Fraser and J. W. Vickery, 11.1933 (SYD); Milton, R. H. Cambage, 22.12.11 (NSW42522); Big Badja, A. B. Costin, 1.1950 (NSW42507). VICTORIA: Dandenong Ranges, Dr. M., Jan. 1853 (MEL). BASS STRAIT: King's Island, Sm. Megowan (MEL); King's Island, W. S. Sayer, 11.87 (MEL). TASMANIA: W. Archer, no locality (NSW42500 and 42699 pro parte); Circular Head, R. C. Gunn, nos. 1049 and 1842, 18.12.1837 (NSW42702).

PELARGONIUM HELMSII, sp. nov.

Herbae perennes plerumque odoriferae. Caules floriferi teretes pilis brevissimis simplicibus glandulosisque vestiti. Lamina folii reniformis vel orbicularis 4.0-1.0 cm. longa, 4.5-1.0 cm. lata crenulata pilis brevissimis obsecta. Petiolus gracilis pilis brevissimis confertis vestita; stipulae deltoideo-lanceolatae; bractea ovato-lanceolatae. Flores 5-12 in umbella conferta dispositi. Sepala elliptico-oblonga 2-5 mm. longa 2-3 mm. lata fere obtusa pilis brevissimis dense vestita. Petala rosea unguolata. Stamina fecunda 4-5. Mericarpia pilosa 3 mm. longa 2 mm. lata, aristas 9-13 mm. longis. Semina nigra vel carnea.

Ascending odoriferous herbs up to 25 cm. tall with fleshy thickened tap-roots but not tuberous, and short perennial stems. *Flowering stems* terete, densely covered with very short simple and glandular hairs. *Leaves* opposite; lamina reniform-orbicular, 1.0-4.0 cm. long, 1.0-4.5 cm. wide, often shallowly lobed, crenate, covered with short scattered hairs; petioles slender, up to 13 cm. long, thickly covered with short hairs; stipules brown, deltoid or lanceolate, 4 mm. long, 3 mm. wide, scarioso-membranous; bracts ovate or broad-lanceolate, 2.5 mm. long, 1.5 mm. wide, scarioso-membranous,

acute, hairy, ciliate. *Peduncles* slender, 3–7 cm. long, pubescent. *Flowers* arranged in compact umbels of 5–12. *Pedicels* densely pubescent with very short, simple and glandular hairs, c. 2 mm. long. *Sepals* united basally into a short tube about 1 mm. long; lobes elliptico-oblong, 3–5 mm. long, 2–3 mm. wide, almost obtuse, thickly clothed with very short, simple and glandular hairs; spur less than 1 mm. long. *Petals* deep pink, more or less unguulate; posterior ones c. 8 mm. long and 3 mm. wide, sometimes with dark pink lines; anterior ones smaller. *Stamens* 10; filaments broadened and irregularly united basally, 4–5 fertile and bearing reniform anthers on short awns. *Fruit*: mericarp, hirsute, ovoid, c. 3 mm. long and 2 mm. wide, awn 9–13 mm. long, glabrous on outside but with long golden hairs on the inner surface; rostrum covered with simple hairs; glabrous upper region plus stigmatic lobes, c. 1 mm. long. *Seeds* smooth or minutely striate, 2.5 mm. long, 1 mm. wide, black or dark grey.

Range: High altitudes in N.S.W.

Habitat: Sub-alpine woodland (*Eucalyptus niphophila* woodland).

Typification: Holotype: Mt. Kosciusko, R. Helms, February, 1893 (NSW42523).

Named after the collector of the specimens which has been selected as the holotype.

Discussion: A species which is quite distinct from others, but which, apparently, has a very restricted distribution, being confined to the Kosciusko plateau. It is, moreover, not common in its native habitat.

Specimens Examined: NEW SOUTH WALES: Mt. Kosciusko, R. Helms, 1901 (NSW 425245); Mt. Kosciusko district, C. Skottsberg and A. B. Costin, 9.3.1947 (NSW42524); Snowy River below Charlotte's Pass, S. McKay, 21.1.1958 (SYD); White's River Hut near Guthega, R. Carolin, no. 794 (SYD).

PELARGONIUM LITTORALE Hügel, *Bot. Arch.*, t. 5 (1837) et ex Endl. in *Enum. Plant. Hügel.*, 14 (1837).

Synonymy: *P. stenanthum* Turcz. in *Bull. Soc. Imp. Nat. Moscou*, 31: 419 (1858). *P. crinitum* Nees in *Lehm., Pl. Preiss.*, 1: 163 (1944) non Harv. et Sond. (1859–60). *P. crinitum* var. *congestum* Nees. in *Lehm., loc. cit.*

Erect or semi-prostrate, perennial, odoriferous herbs with fleshy tap-roots but not tuberous. *Flowering stems* angular or terete, up to 35 cm. tall, covered with scattered, long, spreading, villous hairs and short glandular ones. *Leaves* opposite; lamina ovato-cordate, slightly 5–7-lobed, crenate, (1.0) 2.0–4.0 cm. long, 1.0–3.0 (5.0) cm. wide, sparsely hairy particularly on the veins; petioles slender, 1.0–7.0 cm. long, sparsely villous-patent hairy; stipules brown, scarioso-membranous, ovate to broad-deltoid, up to 4 mm. long and 3 mm. wide, sparsely hairy, ciliate; bracts lanceolate to narrow-ovate, 4 mm. long and 1.5 mm. wide, ciliate. *Peduncles* 2–8 cm. long. *Flowers* arranged in umbels of 2–5 (7); pedicels slender, up to 2 cm. long in the flowering stage, often further elongating in the fruiting stage. *Sepals* united basally into a short tube c. 1 mm. long; lobes lanceolate or narrow-elliptic, 3–4 mm. long, 1.5–2.0 mm. wide, acute, sparsely covered with long, patent-villous hairs and minute glandular ones, membranous at margin, distinctly larger than the mericarps and incurved over them in the fruiting stage; nectary spur 1–3.5 mm. long. *Petals* usually deep pink; posterior ones broad-oblancheolate, scarcely unguulate, c. 6 mm. long and 2 mm. wide; anterior ones narrower. *Stamens* 10; filaments broadened and irregularly united below, 4–5 fertile, about 4 mm. long and bearing shortly oblong anthers. *Fruit*: mericarp hirsute, oblancheolate, 3 mm. long, 1 mm. wide, terminated by a long awn which is glabrous on the outer surface and bears long, white to golden hairs on the inner surface; rostrum 1.5–1.8 mm. long, hirsute; upper glabrous region plus stigmatic lobes c. 2 mm. long. *Seeds* brown to black, very minutely striate, c. 1.5 mm. long and 1 mm. wide or less.

Range: Western Australia and into South Australia.

Habitat: In fairly dry areas and often near the sea.

Typification: *Lectotype*: Swan River, Hügel (no. 44) (W photo SYD). The Director of the Botany Dept. of the Naturhistorische Museum Wien has kindly forwarded the pertinent material housed in his Institute. There are two sheets labelled "Swan River Hügel", neither of which, however, bears a number. The more complete

of these two is named "*P. australe* Willd. Endl. ipse" and the other is labelled "*P. littorale* Hügel". The former is fairly close to the type of *P. crinitum* Nees in Lehm., which is here reduced to synonym (see below). The latter corresponds more closely with Hügel's description and that supplemented by Endlicher, and to the illustration supplied in *Bot. Arch.*, particularly with respect to the length of the nectary spur. The specimen, however, is not exactly equivalent to this illustration and there is no evidence that it was the only element used in drawing up the diagnosis. It must, therefore, be selected as the lectotype. The shorter latin diagnosis accompanying the illustration in *Bot. Arch.* is followed by "Hügel msc." and can therefore be attributed to him. The longer latin diagnosis is attributed to "Endlicher msc.". Both are repeated in *Enum. Pl. Hügel* and the name is attributed there to Hügel. It would appear, then, that the original description is certainly Hügel's and that he should be recognized as the author of the name.

P. crinitum Nees in Lehm. *Syntypes*: In arenosis apertis prope oppidulum Freemantle, Decembri a. 1838, Preiss no. 1905; In solo sublimoso districtus Sussex, Decembri 1839, Preiss no. 1906. The material used by Nees in drawing up his original description has not been located, but specimens of these numbers have been forwarded from GEN (photos SYD) and a photograph of Preiss no. 1906 housed in S has been examined. This material falls within the limits of variation of *P. littorale* as defined above, although the nectary spur is rather longer than usual. Nees states: "A pelargonio littorali Endl. in Hüg. differt caulibus procumbentibus nec erectis, valde angulosus nec teretibus." There would appear to be all gradations between these contrasting characters and the best course seems to be to reduce *P. crinitum* to a synonym of *P. littorale*.

P. crinitum var. *congestum* Nees in Lehm. *Holotype*: Preiss no. 1903. Material of this number has been forwarded from LE, although the holotype itself has not been traced. Preiss no. 1901 is mounted on the same sheet. The specimens (6) included under no. 1903 show considerable variation and, in fact, represent the range of variability to be found in *P. littorale*. The two specimens on the extreme left-hand side (to the observer) correspond most closely to the type description (photo SYD). A photograph has also been forwarded from S and this sheet is rather more uniform, consisting of only two specimens. Once again there appear to be all gradations between the non-congested and the congested umbels; indeed to some extent these are represented on the Leningrad sheet. It does not seem advisable to admit this variety at present.

P. stenanthum Turcz. *Holotype*: Drummond Coll. V. no. 193 (KIEW photo SYD). *Isotypes*: K, GEN photos SYD. The specimen housed in Geneva was kindly forwarded for examination. It agrees quite closely with Preiss's specimens referred to *P. crinitum* by Nees as does the type description.

Selection of Specimens Examined: SOUTH AUSTRALIA: Myponga, J. M. Black, 11.1906 (NSW42476); Kangaroo Island, J. Staer (NSW42479); Thistle Island, Spencer Gulf. J. H. Maiden, Jan. 1907 (NSW42477); Eyre Peninsula, Colton, near Venus Bay, Herb R. Tate, Oct. 1882 (AD95813034); Southern Yorke Peninsula, between Corny Point and Cape Spencer, Hj. Eichler, no. 13977, 26.9.1957 (AD95751017); Naracoorte, E. H. Ising, 25.10.1934 (AD95812074); Encounter Bay, J. B. Cleland, Jan. 1924 (AD95813045); Eucla, J. D. Batt, 1886 (MEL). WESTERN AUSTRALIA: Rottneest Island, G. M. Starr, nos. 17 and 53, 15.4.1956 (WA); Mt. Randall, Darling Range, C. A. Gardner, Aug. 1933 (WA); Chittering, R. D. Royce, no. 4717, Dec. 1952 (WA); Middleton Beach, King George's Sound, B. T. Goadby, no. 296, Dec. 1900 (NSW40494).

GROUP II. Fertile stamens 7-8, rarely 6. Simple hairs villous, pubescent or almost quite absent, not patent. Nectary spur usually quite distinct. Petals at least twice as long as sepals. Root non-tuberous. Sect. PERISTERA pro parte.

PELARGONIUM AUSTRALE Willd., *Spec. Plant.*, 3: 675 (1800).

Synonymy: *P. glomeratum* (Andr.) Jacq., *Ec. Plant. Rar.*, 146 (1816). *P. erodioides* Hook. in *Journ. Bot.*, 1: 252 (1834). *Geranium glomeratum* Andr. *Geraniums*, vol. 2:

87 (1805). *Geranospermum australe* (Willd.) O. Ktze., *Rev. Gen.*, 1: 94 (1891). *Unrecognized varieties*: *P. australe* var. *glabrata* Hook. f., *loc. cit.* *Misapplied names*: *P. inodorum* sec, Sweet, *Geraniaceae*, vol. 1 (1820-22).

Herbaceous scarcely odoriferous perennials with tough, more or less fleshy, but not tuberous, tap-root and short, often rhizomatous, perennial stems. *Flowering stems* terete, erect to semi-prostrate, up to 50 cm. long, branching, covered with long or short, soft villous hairs or pubescent or rarely almost glabrous, always with some minute glandular hairs. *Leaves* opposite; laminae almost orbicular to ovate, sometimes shallowly undulate, 5-7-lobed, sometimes obscurely so, crenate, pubescent or almost glabrous, 2.0-9.0 cm. long, 2.0-8.0 cm. wide or even larger; petioles up to 13 cm. long, villous to pubescent or glabrous; stipules deltoid, 3-4 mm. long and 3 mm. wide, acute, membranous, often hairy; bracts narrow-deltoid to lanceolate, c. 3 mm. long and 0.5 mm. wide, villous or pubescent especially on the thickened mid-rib or glabrous. *Peduncles* 3-10 cm. long, villous to pubescent and bearing an umbel of 4-12 flowers. *Pedicels* 0.2-1.5 cm. long (rarely longer) or flowers sub-sessile, often elongating during the fruiting stages, villous pubescent or almost glabrous. *Sepals* 5, united basally into a short tube; lobes lanceolate to narrow-oblong, 4-7 mm. long, 2-3.5 mm. wide, acute, villous pubescent or glabrous but almost always with numerous minute glandular hairs; nectary spur 1-8 mm. long. *Petals* 5, longer than the sepals, pink to white; posterior ones oblanceolate to obovate unguulate, c. 8 mm. long and 4-6 mm. wide, veins deep pink and often with deep pink spots; anterior ones narrow. *Stamens* 10; filaments broadened and irregularly united below, 7-8 fertile (rarely only 6) and bearing anthers; anthers oblong; pollen yellow to white. *Fruit*: mericarp villous to pubescent, ovoid, c. 2.5 mm. long and 1 mm. wide; awn 6-12 mm. long; rostrum covered with simple and glandular hairs, glabrous upper region plus stigmatic lobes 2-3 mm. long. *Seeds* oblong, black, or grey, very minutely pitted or smooth.

Range: Southern Australia, both inland and coastal, and into Tasmania.

Habitat: Coastal sand-dunes and acid, often granitic, rock outcrops inland.

Typification: *Holotype*: Willdenow no. 12478, sheet 1 (B photo SYD). The material on this sheet seems to be quite homogeneous.

Geranium glomeratum Andr. The type would appear to be the illustration accompanying the type description. The figure and Andrews' statement, ". . . known under the title of Botany Bay Geranium", indicates that the specimen originated from coastal sand-dunes. Sweet's figure of *P. australe* corresponds quite closely to the one under consideration.

P. australe var. *a major* Hook. f. "var. *a*" would seem to imply that Hooker regarded this as the type variety. He cites Gunn 61 and 787 (K photo SYD) which differ little from Willdenow's holotype.

P. australe var. β *glabrata* Hook. f. *Holotype*: Gunn. 658 (K). Until more is known about the inheritance of the "glabrous" condition it is advisable not to recognize this variety.

P. erodioides Hook. *Holotypes*: Mr. Lawrence, Van Dns Land 1833, no. 325 (K photo SYD). This specimen is mounted on the same sheet as some collections made by Gunn. It apparently represents inland forms of the species which this author is unwilling to accept as separate species at present (see discussion).

Discussion: This is an extremely variable species as constituted above, but it seems impossible, as yet, to recognize any constant, sub-specific taxa. The characters that are so variable are indumentum length, pedicel length, calyx spur length and habit. No constant correlation of differences has been noted. There seems little doubt that there are ecological races within this species as cultivation under garden conditions has shown no divergence from the parent field characters. Moreover, under such conditions, there has been quite distinct selective death of the coastal forms in normal garden conditions and the inland forms in very sandy soil. These experiments and breeding experiments are being continued. The forms from Eyre's Peninsula and associated islands and the Recherche archipelago may eventually prove to be distinctive enough to be admitted to a definite status.

Selected Specimens Examined: QUEENSLAND: Granite Hill, Darling Downs, S. L. Everist and L. J. Webb, no. 1366, 23.11.1946 (BRI007605); Stanthorpe, H. Wright, Dec. 1916 (BRI007614). NEW SOUTH WALES: Warrumbungle Ranges, G. W. Althofer, 23.3.1947 (NSW42533); Coree, Queanbeyan, R. H. Cambage, no. 3314, 9.12.11 (NSW26539); Upper Tumut River nr. Kiandra, Whitefield, 3.1924 (NSW42532); Boree, H. S. McKee, no. 534, 4.11.52 (SYD); Kosciusko, J. McLuckie and A. H. K. Petrie, 1.1925 (SYD); The Gib, Bowral, R. H. Cambage, no. 1468, 10.2.1906 (SYD); N. Coast. L. Leichardt, no. 168, 6.11.1842 (NSW42416); Curl Curl, T. G. B. Osborn, 5.1928 (SYD); Garie Beach, National Park, R. Carolin, no. 441, 18.3.1958 (SYD); Lake Conjola, G. L. Rodway, 26 Feb. 1933 (NSW42429); Brush Island, F. A. Rodway, 5 Sept. 37 (NSW42420). VICTORIA: Mt. Buffalo, H. C. E. Stewart, 6 Jan. 1950 (BRI007604); Enoch Point, J. George, 1882 (MEL); Wilson's Promontory, Musgrave (MEL). BASS STRAIT: King's Island, C. French, 11.87 (MEL); Rock Island, C. E. Lord (HO). TASMANIA: Lyell Highway, 64 miles from Hobart, R. Carolin, no. 1363, 16.1.1960 (SYD); Roaring Beach, N.E. of Nubeena, Tasman Peninsula, R. Carolin, no. 1805, 9.2.1960 (SYD). SOUTH AUSTRALIA: Waikerie, J. B. Cleland, 30.11.1913 (AD95830022); Murray Bridge, W. Ham, 26.3.1921 (AD95816006); Encounter Bay, J. B. Cleland, Jan. 1924 (AD95830019); Largs Bay, Herb. J. M. Black, 22.11.1916 (AD95813040); Ravine des Casoars, Kangaroo Island, J. B. Cleland, 2.2.1950 (AD95830006); Gawler Ranges, Dr. Sullivan (MEL). WESTERN AUSTRALIA: Gilakin Rock, C. V. Malcolm, 24.10.1959 (W.A.).

PELARGONIUM DRUMMONDII Turcz., in *Bull. Soc. Imp. Nat. Moscou*. 31: 421 (1858).

Ascending, very weakly odoriferous perennial with more or less erect semi-succulent sub-ligneous, pubescent perennial stems which are covered in the upper parts with persistent stipules and about 1 cm. wide. *Flowering* stems obscurely angled or terete, covered with a soft spreading pubescence often interspersed with longer villous hairs, c. 30 cm. tall and up to 4 mm. wide. Basal leaves apparently alternate; lamina cordate-reniform, obscurely 5-lobed, up to 4 cm. wide and 3 cm. long, crenate, pubescent on both surfaces; petioles pubescent, 10-15 cm. long, often more or less persistent. Leaves on the flowering stems similar but mostly opposite and with shorter petioles; stipules brown, scariose, deltoid-acuminate, 5-10 mm. long, 3-5 mm. wide, somewhat pubescent; bracts brown-yellow tinged with pink with a distinct mid-rib, lanceolate-deltoid, c. 5 mm. long and 1.5 mm. wide, pubescent, ciliate. *Peduncles* pubescent, up to 6 cm. long, bearing an umbel of 3-8 flowers each on a slender pedicel 8-12 mm. long. *Sepals* united basally into a tube c. 1.5 mm. long, covered with soft spreading villous hairs; lobes narrow-elliptic to elliptic, c. 5 mm. long and 2 mm. wide, acute, or with a very short mucro and membranous towards the margin; nectar spur 5 mm. long to almost obsolete. *Petals* pink; posterior ones obovate, unguulate, 14 mm. long, 12 mm. wide, with dark lines and spots marking them; anterior ones without darker lines and spots and usually narrower, 12 mm. long and 4 mm. wide. *Stamens* 10; filaments broadened and irregularly united below, 7 (4 long and 3 short) bearing anthers and somewhat longer than the others; pollen orange. *Fruit*: mericarp obovoid, villous; rostrum c. 14 mm. long, villous hairs ceasing very abruptly at the base of the upper glabrous region which, with the stigmatic lobes, is c. 4 mm. long. *Seeds* grey.

Range: Western Australia: Porongorup Ranges to Mt. Melville.

Habitat: Amongst granite boulders.

Typification: *Holotype*: Drummond coll. V 191 (KIEW photo SYD), isotypes K (photo SYD), MEL, NSW. Hooker misapplied this name, Hook. f., *Curt. Bot. Mag.*, ser. 3, 50: 7346 (1894), to *P. capitatum* (see below) and Knuth cites it as a synonym of both *P. australe* and *P. capitatum*. The specimen at Kew is the most complete; descriptions supplied by that institute show that the scraps housed in Sydney and Melbourne are conspecific with it. In general the petals of these specimens are pink and not "(in sicco) alba" as described by Turczaninow. The photographs supplied by Kiew leave little doubt that the collection was an homogeneous one.

Discussion: The species is clearly different from *P. capitatum*. The semi-succulent main stems, the softer pubescence, the pedicellate flowers, the shape of the bracts and

stipules all serve to separate them from each other. In addition it would seem that *P. drummondii* is not a species of the coastal sand-dunes like *P. capitatum*, but occurs further inland in rocky country. Turczaninow stated that it belongs to the "Alchimiloideae", a subsection of the section *Eumorpha* according to Knuth. Its affinities may indeed lie here or in sect. *Cortusina*, although its relationships with *P. australe* seem to be quite close. The author has been unable to relate these specimens to any extra-Australian species to date. It would seem, in fact, that the species is distinct. Well-located specimens are the result of only a few collections, from two ranges of hills, the specimens being well established away from habitation. In short it shows the distributional characteristics of a restricted species and not of an introduction which would usually be rather tenuously established near habitation or aggressively expansive. The final solution of the problem may well have to await a full-scale monograph on the genus.

Specimens Examined: WESTERN AUSTRALIA: Nancy's Peak, Porongorup Ranges, B. G. Briggs, 10.10.1960 (NSW52439 et SYD); Summit of Nancy Peak, Porongorup Ranges, R. D. Royce, no. 6118, 29 Oct. 1959 (WA); Mt. Melville, C. A. Gardner, Albany, Feb. 1939 (WA).

N.B. Mr. J. H. Willis of the State Herbarium of Victoria has kindly sent me some interesting notes on Drummond's various collections. From this it would appear to be highly probable that he collected from one of the areas mentioned in "Specimens Examined".

GROUP III. Roots tuberous. Fertile stamens 6-8. Simple hairs absent or if present then scarcely patent. Nectary-tube long. Petals much longer than sepals. Sect. POLYACTIUM.

PELARGONIUM RODNEYANUM Mitch. ex Lindl. in Mitch., *Three exped.*, II: 44 (1839).

Synonymy: *Geranospermum rodneyanum* (Mitch. ex Lindl.) O. Ktze., *Rev. Gen.*, 1: 94 (1891).

Erect perennials with basal perennial stems, the lower part of which may be a narrow vertical rhizome expanding above, and with a number of brown, red or whitish tuberous swellings on the roots sometimes arranged in chains. *Flowering stems* terete. 8-35 cm. tall, usually simple or once branched, covered with short glandular hairs, occasionally with some long simple hairs scattered over the surface. *Leaves* mostly on the basal stems, few on the flowering stems, opposite; laminae ovate-cordate or ovate, 2-4 cm. long, 1.5-4.0 (5.0) cm. wide, sometimes slightly 5-7-lobed, crenate, a few scattered hairs present on the veins; petioles slender, (1.5) 7.0 (10.0) cm. long; stipules yellow, scarioso-membranous, ovate to elliptic, 3-4 mm. long, 2-3 mm. wide, usually obtuse but sometimes acute, glandular-hairy, ciliate on the margin; bracts usually deltoid, occasionally lanceolate, 2-3 mm. long, 1-1.5 mm. wide, otherwise similar to the stipules. *Peduncles* often derived from the base of the plant. *Flowers*: 2-7 per umbel; pedicels slender, 1.3-2.2 cm. long, puberulent and rarely with a few spreading villous hairs. *Sepals* deep pink, united basally into a tube c. 1 mm. long; lobes lanceolate to narrow-elliptic, 3-5 mm. long, 1-3 mm. wide, acute, often with small macro, puberulent with glandular hairs and a few short simple hairs which are sometimes quite absent; nectary spur (3) 5-9 mm. long. *Petals* deep pink, very unequal; posterior ones obovate, 1.3-1.7 cm. long, 6-8 mm. wide, unguulate and with darker streaks and spots; anterior ones narrow sub-ligulate. *Stamens* 10; filaments broadened and irregularly united below, 7-8 fertile, longer than the others and bearing oblong anthers. *Fruit*: mericarp pilose, oblanceolate, 2 mm. long, 1 mm. wide, terminated by a long awn; rostrum 1.6-2.0 cm. long, hirsute, upper glabrous region plus stigmatic lobes c. 4 mm. long. *Seeds* dark grey, minutely striate, 1.5 mm. long, 1.0 mm. wide.

Range: South-eastern Australia and into South Australia.

Habitat: Usually amongst granitic outcrops and often growing from the clefts between the rocks.

Typification: *Holotype*: Major Mitchell's Expedition 1836, 21 June, no. 184 (CANTAB photo NSW).

Discussion: A fairly distinct species, although its relationships with the other groups are by no means clear as yet.

Selected Specimens Examined: NEW SOUTH WALES: Bungonia Lookout, nr. caves, E. F. Constable, 23 Jan. 1956 (NSW36703); Endrick River near Nerriga, F. A. Rodway, no. 995, 27 Nov. 1932 (NSW42455); Eucumbeen, W. H. Dillon, 1893 (MEL). VICTORIA: Grampian Mt., Victoria, E. H. Ising, no. 2321, 6 Jan. 1927 (AD95730012); Mt. Macedon, R. H. Cabbage, 11.1.13 (NSW42463). SOUTH AUSTRALIA: Lucindale, E. H. Ising, 13.12.1934 (AD95812075); Cave Range, west of Penda, Herb. Tate, 25.11.1882 (AD 95813028); 7 miles south of Coonalpyn, M. C. R. Sharrod, sine date (SYD).

PELARGONIUM HAVLASAE Domin in *Vestn. Krel. Ces. Spolek*, Nauk 11: 49 (1923).

Erect herbs often with a thin erect rhizome terminated by the perennial basal stems. *Flowering stems* up to 15 cm. tall with a few short simple hairs and some minute glandular ones scattered over the surface, usually simple and terminated by a few-flowered umbel. *Leaves* mostly attached to the perennial stems; laminae ovato-cordate, 1.0–1.8 cm. long, 1.5–2.2 cm. wide, obscurely 5–7-lobed, crenate, sparsely hairy or sub-glabrous; petioles slender, 1.0–8.0 cm. long, sparsely hairy; stipules ovate, 3 mm. long, 2 mm. wide, acute, membranous, brown, scarcely hirsute or ciliate; bracts broad-lanceolate, c. 3 mm. long and 1.5 mm. wide, otherwise similar to the stipules. *Peduncles* mostly springing from the base of the plant and up to 15 cm. long. *Flowers:* 4 per umbel or very rarely solitary; pedicels slender, 15–30 mm. long in flowering stages, pubescent or puberulent with glandular hairs and some short simple ones. *Sepals* united basally into a tube c. 1 mm. long; lobes lanceolate or narrow-oblong, c. 4 mm. long and 2 mm. wide, acute, puberulent or rarely hirsute with short simple hairs and denser glandular hairs, membranous towards the margin; nectary spur 1–6 mm. long. *Petals* white or very pale pink with deeper veins; posterior ones obovate, 7–10 mm. long, 4–5 mm. wide, unguulate; anterior ones narrower and usually without the deeper veins. *Stamens* 10; filaments broadened and irregularly united below, 6–7 fertile, c. 6 mm. long, and somewhat longer than the rest; anthers oblong. *Fruit:* mericarp oblanceolate, c. 2.5 mm. long and 1 mm. wide, villous; rostrum covered with simple and glandular hairs; upper glabrous region plus stigmatic lobes 3–4 mm. long. *Seeds* not seen.

Range: Southern parts of Western Australia.

Habitat: Unrecorded, and so far not observed in the field by this author.

Typification: Holotype: A. A. Dorrien-Smith, W.A. (K).

Discussion: This species must be quite closely allied to *P. rodneyanum*, although no one has so far stated that it has tuberous roots. Field observations are badly needed on this species.

Selected Specimens Examined: WESTERN AUSTRALIA: Near Wagin, C. A. Gardner, no. 6474, 8 Oct. 1942 (WA); District Stirling, C. A. Gardner, no. 2087, 30 Sept. 1928 (WA); Beatley, R. Helms, Sept. 98 (NSW42470); Cowcowning, Max Koch, no. 1174, Sept. 1904 (AD95813014); Drummond, no. 30 (MEL) (collection uncertain).

INTRODUCED SPECIES. (The descriptions given below refer to Australian material only and are not intended to be complete but merely diagnostic.)

All these species, but for *P. fragrans*, are grouped in sect. *Pelargium* by Knuth. *P. fragrans* he places in sect. *Cortusina*.

PELARGONIUM CAPITATUM (L.) Ait., *Hort. Kew*, 2: 425 (1789).

Synonymy: J. D. Hooker misapplied the name *P. drummondii* Turcz. to this species.

Straggling, odoriferous, shrubby, perennials up to 1 metre tall. Stems terete and covered with soft spreading villous hairs. *Leaves* alternate or opposite; laminae ovato-cordate in outline, 2–8 cm. long, 2–8 cm. wide, deeply 3–7-lobed, dentate, undulate, villous, petioles 2–6 cm. long, villous; stipules ovato-acuminate or acute, usually quite broad, c. 8 mm. long; bracts elliptic to oblong, c. 6 mm. long and 2.5 mm. wide, otherwise similar to the stipules. *Stamens* 10; filaments broadened and irregularly united below, pink above, about seven fertile and somewhat longer than the others; pollen

orange. *Fruit* villous; mericarp oblanceolate, 5 mm. long; awn c. 2 mm. long; upper glabrous part of villous rostrum plus stigmatic lobes c. 7 mm. long. *Seeds* brown reticulo-striate.

Range: A native of the Cape Peninsula, South Africa, introduced very early in the history of colonization, probably in shipping ballast, and now well established at various points around the coast.

Habitat: Sand-dunes.

J. D. Hooker's figure and description, *Curt. Bot. Mag.*, ser. 3, 50: 7346 (1894), of *P. drummondii* Turcz. leave little doubt that he was, in fact, dealing with *P. capitatum* in spite of his insistence on the similarities with *P. australe*. "Undershrubs 2 ft. . . . clothed with a soft more or less glandular fragrant pubescence, branches robust" is particularly significant. (Also see above under *P. drummondii*.)

Selection of Specimens Examined: WESTERN AUSTRALIA: Sea coast at Swanbourne, P. R. Gorrie, July 1938 (WA); Garden Island, March, 1941, B. T. Goadby (WA); Perth, R. Helms, 2.11.98 (NSW42440). NEW SOUTH WALES: Kurnell, R. Carolin, no. 530, 28.9.1958 (SYD); Cape Solander, L. A. S. Johnson, 20.10.1945 (NSW42435).

PELARGONIUM × ASPERUM Ehr. ex Willd., *Sp. Plant.*, ed. 4, 3: 678 (1800).

Synonymy: (from Moore, 1955) *P. roseum* Willd. ex Spreng. non Ehr. nec (Andr.) Ait. *P. rosodorum* Hoffmanssegg. *P. graveolens* L'Her. ex Ait. × *P. radens* H. E. Moore.

Shrubs up to 1 metre tall with a characteristic odour. *Stems* terete, erect, c. 6 mm. thick, covered with harsh hairs. *Leaves* alternate or opposite: laminae ovate in outline, margins recurved, up to 7 cm. long and 6 cm. wide, deeply more or less pinnately dissected into 5-7 lobes, dentate, hirsute with harsh hairs, aromatic, paler on the undersurface, petioles 4-10 cm. long, hirsute; stipules membranous-scariose ovate or deltoid, 7 mm. long, 4 mm. wide, ciliate; bracts lanceolate to narrow-ovate. *Peduncles* 3-6 cm. long bearing an umbel of 5-10 flowers. *Flowers* subsessile or with pedicels up to 6 mm. long. *Sepals* lanceolate to narrow-elliptic, 6-9 mm. long, 2-4 mm. wide, united basally into a very short tube, hirsute, membranous towards the margin and sometimes with a short mucro; nectary spur 2-4 mm. long. *Petals* pink, oblanceolate to obovate; posterior ones obovate, unguulate, 1-2 cm. long and about 5 mm. wide, marked with pink to purple lines and/or spots; anterior ones smaller and with smaller dark markings. *Stamens* 10; filaments broadened below, about six fertile bearing oblong anthers and somewhat longer than the others; pollen orange. *Fruit*: mericarp ovoid to oblanceolate with a terminal awn bearing harsh brown hairs on the inner surface; rostrum hirsute, upper glabrous part plus stigmatic lobes 5-7 mm. long. *Seeds* dark grey, ovoid, seed-set is usually poor when compared with the indigenous species.

Range: Introduced from the Mediterranean regions of Europe where it is cultivated for its volatile oils used in perfumes. Now well established around some cities and towns in southern Australia.

Habitat: Open places.

Selected Specimens Examined: NEW SOUTH WALES: Castle Crag, Sydney, H. S. McKee, July 1950 (SYD); Woy Woy, H. S. McKee, no. 6694, 25.12.1958 (SYD). SOUTH AUSTRALIA: Mount Lofty Range, Victor Harbour and Happy Valley, J. M. Black (AD95813044); south of Ashville, 25 km. north of Meningie, M. C. Sharrad, no. 327, 3.11.1959 (SYD).

Discussion: The specimens previously referred to *P. graveolens* L'Her. ex Ait, are probably none of them strictly typical of that species. Moore (1955) provides a key to the cultivated species of *Pelargonium* and in it he distinguishes between *P. graveolens* and *P. radens* thus: "17. Margins of leaves rolled under, the lobes very deeply divided into narrow segments with short, stiff, rasp-like hairs on both surfaces . . . *P. radens*. 17* Margin of the leaves not rolled under, the lobes rather shallowly toothed with soft, slender hairs on both surfaces . . . *P. graveolens*."

All the specimens examined which originated from naturalized localities in Australia fall between these two extremes. All possess more or less harsh hairs, all have leaf-margins rolled under to some degree and the dissection of the leaves is

extremely variable. Earlier in his treatment Moore discusses the position of *P. × asperum*. This, he states, is probably a hybrid between the two species under discussion. The plate which he reproduces from Roth. (1787) is not clear enough to distinguish the important points. He notes that the hybrid is very variable falling between the extremes of the two parents. It would appear that all the Australian material should be referred here.

PELARGONIUM DOMESTICUM L. H. Bailey. The very variable group of cultivated "show" Pelargonium covered by this name has become naturalized in a number of places. The nomenclature is extremely complex and it is proposed that this name be maintained for the time being.

Selected Specimens Examined: WESTERN AUSTRALIA: Yoongarallup, Bussleton district, R. D. Royce, no. 3899, 19 Oct. 1952 (WA). SOUTH AUSTRALIA: Near Finnis ca. 60 km. south of Adelaide, J. B. Cleland, 11.10.1949 (AD95829079). NEW SOUTH WALES: La Perouse, D. Kilgannon, 13.9.1949 (SYD). TASMANIA: Eaglehawk Neck, Tasman Peninsula, R. Carolin, no. 1817, 9.2.1960 (SYD).

PELARGONIUM FRAGRANS Willd. has been collected once from a naturalized (?) locality. It is a native of South Africa and is cultivated for its volatile oil.

Key to the Species.

1. Leaves deeply pinnately or palmately dissected; hairs harsh *P. × asperum* Ehr. ex Willd.
- 1.* Leaves shallowly lobed or almost entire; hairs villous to pubescent or puberulent, soft.
2. Lobes of the leaf acute *P. × domesticum* Bailey.
- 2.* Lobes of the leaf obtuse.
3. Fertile stamens 3-5 (rarely 6); perennial stems short and not succulent.
4. Hairs on the calyx short and coarse, petals seldom much exceeding sepals.
5. Hairs on the calyx dense; sepals obtuse *P. helmsii* Carolin.
- 5.* Hairs on the calyx scattered; sepals acute *P. inodorum* Willd.
- 4.* Hairs on the calyx long and patent, villous *P. littorale* Hüg.
- 3.* Fertile stamens 6-8; very rarely 5 and then perennial stems semi-succulent.
6. Basal (perennial) stems short, thick, semi-succulent *P. drummondii* Turcz.
- 6.* Basal stems not semi-succulent or plants shrubby.
7. Roots not tuberous; nectary spur seldom as long as calyx-lobes.
8. Bracts broad-ovate; habit shrubby (Fig. 1) *P. capitatum* (L.) Ait.
- 8.* Bracts lanceolate; habit as in Fig. 1 *P. australe* Willd.
- 7.* Roots tuberous; calyx spur as long as or longer than calyx lobes.
9. Corolla white to very pale pink *P. havlasae* Domin.
- 9.* Corolla pink to pale purple *P. rodneyanum* Mitch. ex Lindl. in Mitch.

GENERAL DISCUSSION.

This study has been made with reference to Australian species only. The sections of the genus into which other authors have placed these species are indicated, although it seems that a new critical analysis of these sections is required. The groups which have been indicated above are considered to be systematic units, the actual category should remain in abeyance until a complete monograph is attempted. Groups I and II show some affinities with *P. grossularioides* (L.) Ait., a complex South African species with apparently related taxa in Madagascar and western India. The genus is not recorded from South America, Oceania or Indonesia, although there is a species endemic to Tristan da Cunha. It seems, then, that it is most likely to be part of a small South African element in the Australian flora.

Some interesting points arise from a study of the distributions of the indigenous species. In Group I, which is a well defined unit, *P. helmsii* is the very high altitude representative found only on the highest parts of the continent; the other two species are geographically vicarious. The change, however, occurs not at the head of the Bight where most floristic changes in southern Australia occur, but somewhere in western Victoria. The determining factor in this case is probably something associated with the Eastern Highlands and their climate. With regard to *P. australe* it is interesting to note the paucity of material from Western Australia, where it is,

apparently, exclusively an inland species. The soft-leaved dune-form seems to have originated in the east and to have been confined there. The break occurs somewhere in South Australia or at the head of the Bight. *P. drummondii* is quite restricted. Group III shows a distribution resembling that of the two subspecies of *Erodium cygnorum* Nees in Lehm. (Carolin, 1958). *P. rodneyanum* occurs in the east and *P. havlasae* in the west. The arid, limestone country at the head of the Bight seems to have been a more effective barrier in this case than in that of the *Erodia*.

A survey of the chromosome numbers has not been completed, but it seems that there are differences in basic number between the indigenous species. The number Hare and Beuzenberg (1960) give for *P. inodorum* ($n = 11$) has been confirmed for the Australian material and *P. australe* has a number of $2n = 18$. A subsequent paper will deal with this aspect when the survey is complete.

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